



SECTION B — CASE STUDY — 5 MARKS

A male patient aged 70 years, suffered from fracture neck femur of the left side. He was operated for the fracture. After the operation, he was unable to move even in bed although he was encouraged to move. Three days after the operation, the doctor observed swelling in his left leg and was diagnosed as deep venous thrombosis

1-Mention two causes of occurrence of deep venous thrombosis in this patient

a-....Prolonged bed rest...

b-.....increase of active coagulation factor in blood...... (بسبب العملية)

2-The patient received heparin three times daily and dicumarol once daily

a-What is the mode of action of dicumarol?

..Competitive inhibition of vit K at liver receptor → formation of factor 2 7 9 10...................................

b-How heparin is given

- Orally
- By injection

Coagulation time

3-After two days, heparin treatment was stopped and dicumarol treatment continues How efficacies of dicumarol treatment can is adjusted

a-By measuring bleeding time

(b)-By measuring prothrombin time

c-By measuring platelet count

d-By measuring fibrinogen level in plasma

4-Ten days later, the patient suffers from severe bleeding from a slight cut in the face. The clotting of blood doers not occur. This was diagnosed as a complication of dicumarol therapy. Choose a substance to give to the patient

a-Injection of sodium citrate

(b)-Injection of vitamin K

c-Injection of calcium chloride

d-Injection of active protein C

Part II: Case study and Diagram **(Total marks: 10 marks)**

8- Case study: **(5marks: each question 1 mark)**

A 30-year-old man consults his physician because his stools have been black for a long time. He has been aware of severe epigastric pain over the last 2 years. He also noticed that he becomes easily fatigued and short of breath when he climbs a flight of stairs. The patient has been under severe stress at work and he is a heavy cigarette smoker. By examination the physician noticed that he is very pale; the pallor is most obvious in the conjunctiva and nail beds (but he is not cyanotic), his heart rate is 110beats/min and his stool is black and positive for blood. Blood tests showed that hematocrit is 21%, hemoglobin is 6 g/dL and the red cell count is 4 million/mm^3. The physician diagnosed him as having chronic bleeding from peptic ulcer due to severe stress and cigarette smoking.

Please turn over →

Questions:

1- Using the blood tests, is this patient suffering from anemia? What is its type? Use calculations to explain your answer (Please write equations).

2- What is the relation between the patient's pallor, shortness of breath, elevated heart rate and the presence of blood in stools?

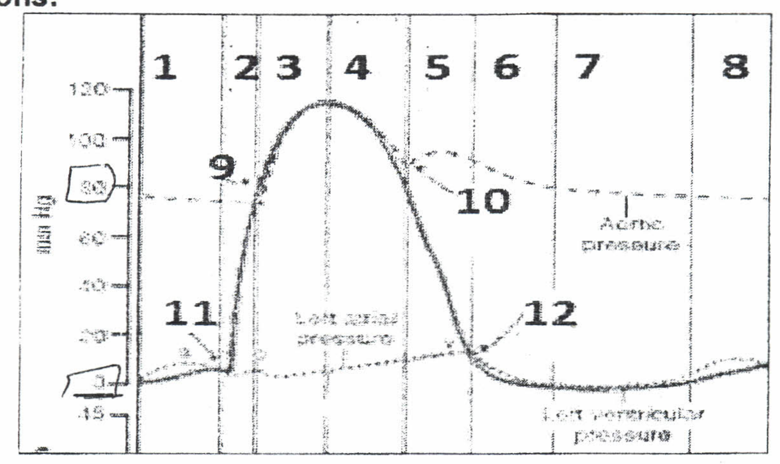
3- This patient has anaemic hypoxia, what occurs to the hemoglobin O_2 dissociation curve? What is the significance?

4- Explain what is meant by the O_2 capacity of blood and the percentage saturation of hemoglobin with O_2 (%HbO_2). Comment on their change in this patient

5-This patient shows no cyanosis, define cyanosis and explain why it is absent in this case?

9- Diagram question: (5marks: each question 1mark)

Study the curve below representing aortic, ventricular and atrial pressure changes during the phases of the cardiac cycle. Answer the following questions:



Questions:

1- Mention the state of the aortic valve at points [9] and [10] and the state of mitral valve at points [11] and [12]. Explain how it affects the occurrence of heart sounds

2- Describe the components of the catacrotic limb of the aortic pressure curve. Explain cause of each component

3- What is the name of phases [2], [3], and [4] of cardiac cycle? Describe changes in left ventricular pressure during these phases

4- What is the name of phases [6], [7], and [8] of the cardiac cycle? Comment on the atrial pressure during these phases

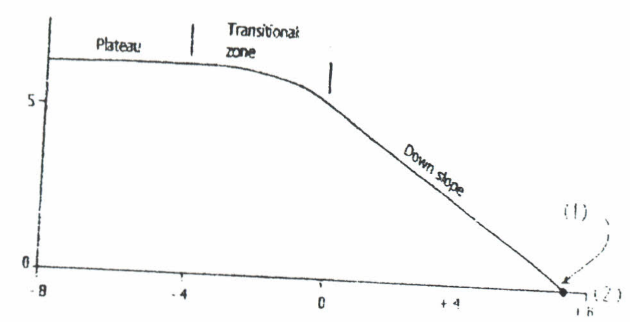
5- What is phase [1] of the cardiac cycle? Comment on its relation to ventricular filling and atrial pressure curve

30% , a wave

2, ascending ⇒ blood ejection within aorta — amount of blood pump in V
descending limb ⇒ - before dicrotic wave → — amount of blood pumped (aortic valve close)
- after stop of blood
cause of dicrotic notch.
wave.

Section [C]:

Study the following graph and answer the questions that follow: (5 marks)



1- **This graph represents** (1 mark)

a- Venous return curve
b- Cardiac output curve
c- Atrial pressure during cardiac cycle
d- Starling law curve

A

2- **Point 1 represents** (1 mark)

a- Mean arterial blood pressure
b- Mean systemic filling pressure
c- Mean atrial pressure
d- Atrial pressure during systole

B

3- **The units at 2 on the curve represent:** (1 mark)

a- Rt atrial pressure mmHg
b- Rt atrial pressure cm water
c- Venous return ml/min
d- Venous return L/min

A

4- **Explain the cause of the plateau phase of the curve.** (1 mark)

Plateau occurs as RAP becomes less than -1 mmHg. At this pressure the large intrathoracic viens collapse and no further increase in VR.

5- **Mention 2 causes of shift of the curve upwards** (1 mark)

a- Increased blood volume
b- Venoconstriction at constant volume

5

Section [D]: Case study (5 marks)

Hoda is a 20-year-old college graduate. Over the last 6 months she complained of extreme eye strain (fatigue) when she read for longer than 15 min. she became tired when she chewed food or dried her hair. She was diagnosed with Myasthenia gravis. She immediately felt better when she took prostigmine (anticholine esterase). Antibody test confirmed the diagnosis of myasthenia gravis.

Questions:

1- **List the steps involved in neuromuscular transmission** (2 marks)

1) As the nerve impulse reaches the nerve ending, it increases the membrane permeability to Ca^{2+} through opening of **voltage-gated Ca^{++} channels.**

2) Ca^{2+} enters the nerve endings and triggers a marked increase in exocytosis of the acetylcholine - containing vesicles.

3) The Ach diffuses to the muscle to bind to its receptor in the MEP.

When the channel is opened, after binding of the receptor to Ach, it increases Na^+ and K^+ conductance of the membrane. The amount of Na^+ entering the cell exceeds the amount of K^+ leaving the cell, and the cell depolarises. Such response in MEP is called **end-plate potential (EPP).**

4) The EPP **depolarizes the muscle membrane to threshold:**

2- **Explain why does severe muscle weakness occur in myathenia gravis?** (1 mark)

Autoimmune disease ⟶ antibodies against A.ch receptors ⟶ decrease number of receptors.

3- **Why does prostigmine improve muscle strength in myathenia gravis?** (1 mark)

Inactivation of A.ch esterase ⟶ accumulation of adequate amounts of A.ch.

4- **What antibody was measured in Hoda's serum?** (1/2 mark)

Antibodies against A.ch receptors at the motor end plate

5- **Which of these drugs is contraindicated in myathenia gravis: Curare – serine.** (1/2 mark)

Curare

5

Section (E) : Case study

A 40-year-old-man suffering from severe hemorrhage caused by a road traffic accident was brought to the ICU at Kasr El-Eini hospital. he was very pale, cold, very anxious, restless and thirsty, and his pulse was weak. Table below shows his blood pressure and heart rate in the lying (supine) position. Hamatocrite value was 30%.

Parameter	Lying down
Blood pressure	60/30 mmHg
Heart rate	150 beat/min

Immediately following infusion of 2 L of blood, his blood pressure rose to 110/70, his heart rate slowed to 100 beats/min and his skin color had returned to normal.

Questions :

decrease blood Vol. → ↓ VR ↓ preload ↓ S.V → ↓ ABP

1. How did this blood lose lead to decreased arterial pressure?
2. Explain the mechanism that elevated his heart rate following blood loss. — to VMA ++ to CIA; ++ plasma without RBCs; to capill.
3. Give reason for the following observations :
   - a- Skin was pale and cold. increase sympathetic VC of skin
   - b- Hematocrite value was decreased. ~~after attack~~ due to interstitial fluid shift to
   - c- The patient was restless and anxious. ++ Sympathetic — stimulated reticular formation
4. If central venous pressure had been measured, would you expect their values to have been increased, decreased, or the same as in a healthy person? (decreased circled) CVP → index about bl. vol.
5. Mention three hormones that are increased in the blood and help to restore extracellular fluid (ECF) volume. Mention the action of each.
   - a- aldosteron ...... It's action is Na, water retension
   - b- angiotensin... . Its action is Na .... and reapsorbtion
   - c- Vasopressin . Its action is water retension

SECTION B **CASE STUDY** **5 MARKS**

A 10-year old girl presented to the clinic with a one-year history of drooping of her eyelids which started gradually and varied in severity, being more at the end of the day or when tired. She also complains of frequent muscular weakness and easy fatigability, difficulty in swallowing, chewing, these symptoms were mild or absent in the morning and tended to worsen through the day. After examination, she was diagnosed of *myasthenia gravis.* The diagnosis was confirmed upon detection of an abnormally elevated level of acetylcholine receptor antibodies

Answer the following questions:

1- What is Myasthenia gravis? Why she was diagnosed with it?

(1) Autoimmune disease with antibodies against ACh-receptors

Muscle weakness - easy fatigability - antibodies against ACh-receptors

2- What is the cause of her muscle weakness?

(1) Antibodies against ACh - receptors. ACh release is normal but ACh-receptors decrease → ↓ E.P.P. → failure of EPP to reach threshold for muscle action potentials

3- What is the effect of acetylcholine released at the motor end plate?

(1) ACh binds to its receptor at MEP → ↑ Na+, K+ conductance of membrane. Na+ entering > K+ leaving → cell depolarizes

4- Is this effect long in duration? Explain. (1)

NO. It is short because after binding to its receptor ACh dissociates from receptor and is hydrolyzed by ACh esterase in synaptic cleft

5- How can you treat this patient?

(1) ACh esterase inhibitors e.g. neostigmine

They inactivates ACh esterase → accumulation of adequate amounts of ACh to produce normal muscle activity.

Part II: Case study and Diagram (Total marks: 10 marks)

8- Case study: (5marks: each question 1 mark)

A 20-year-old woman with a long history of asthmatic attacks was admitted to the hospital because of severe respiratory distress. The current asthmatic attack failed to respond to the usual antihistaminic drug that was self-administered. When seen by the physician, she was sitting up, obviously anxious, and desperately trying to breathe. She was slightly cyanotic, sweating and wheezing. She was given oxygen and epinephrine, and her symptoms subsided considerably after that.

Questions:

1- What is the cause of difficulty in breathing in this patient? Comment on her work of breathing

2- The patient was using an antihistaminic drug to stop the bronchoconstrictor action of histamine. Innumerate another 2 factors which produce bronchoconstriction

3- Explain why she was given epinephrine. Which autonomic receptor epinephrine stimulated in this case?

4- Define cyanosis. In this patient what is its cause and how it was treated?

5- Why is asthmatic attacks associated with hyper-inflated lungs? By using the spirometer how can you diagnose bronchial asthma?

9- Diagram question: (5marks: each question 1mark)

Study the curve below, and then answer the following questions:

(a)

Membrane potential (mV)

0

-50

-100

0

3

4

Threshold

0

0.15

0.30

Time (s)

Questions:

1- What does this curve represent?

2- What is the name of phase [4], describe its ionic causes and explain the effect of hypokalemia on this phase

3- What does phase [0] represent, what are its ionic basis and why its slope is slow?

4- What is phase [3], mention the opened and the inactivated channels in this phase illustrating the result on membrane conductance

5- What is the effect of sympathetic and parasympathetic stimulation on this curve? Explain your answer

8- Case study: **(5marks: each question 1 mark)**

A 68-year-old widow is seen by her physician because of complaints of fatigue and mild memory loss. The patient has some neurologic manifestations such as numbness, weakness and paresthesia in the extremities. Blood gases (%HbO_2, PO_2, PCO_2, and pH) are normal. Her serum vitamin B_{12} is low, but her serum folate, thyroxin-stimulating hormone (TSH), and liver enzymes are normal. Blood analysis showed: RBCs: 2.14×10^6 /mm^3, Hematocrit: 22.7%, Hemoglobin: 8.4 g/dl

Reticulocytes: 2.6% (N: 0.5-1.5%). She was diagnosed of anemia and was given the proper treatment.

Questions:

1- What is the cause and type of this patient's anemia? Explain your answer (use calculation)

2- What is the cause of the neurological manifestations in this patient?

3- Why is the percentage saturation of hemoglobin with oxygen (%HbO_2) normal in this anemic patient?

4- Why during examination the patient's liver function was investigated?

5- The patient has low level of vitamin B_{12}. What are the possible causes of this deficiency?

9- Diagram question: **(5marks: each question 1mark)**

Study the *jugular venous pulse curve* below, and then answer the following questions:

Questions:

1- The [a] wave occurs at which phase of the cardiac cycle? Which heart sound is produced during this phase and what is its cause?

2- What is the cause of the [c] wave? Mention at which phase of the cardiac cycle it occurred. Comment on the ventricular pressure changes and heart sounds produced during this phase

3- What is the cause of the [x'] wave? Explain how this helps venous return

4- What does the [v] wave represent? Mention what is the relation between the carotid pulse and both the [v] and [x'] waves

5- What is the cause of the [y] wave? Mention during which phase of the cardiac cycle it occurs and explain the arterial pressure changes during this phase

8- Case study: (5marks: each question 1 mark)

A 23-year-old man was injured in a car accident and was badly cut. Before the ambulance arrives he lost a lot of blood. When he arrives to the hospital, examination revealed low blood pressure (85/60), tachycardia (110 beats/min), pale cold skin. The doctor also noticed that the patient is anxious, confused, and generally weak. He has rapidness in breathing. The patient was diagnosed as being in shock and started treatment immediately.

Questions:

1- What type of shock is this patient having? Mention 2 other causes that can produce it

2- What is the cause of hypotension and tachycardia of this patient?

3- What is the cause of pale cold skin and rapid respiration?

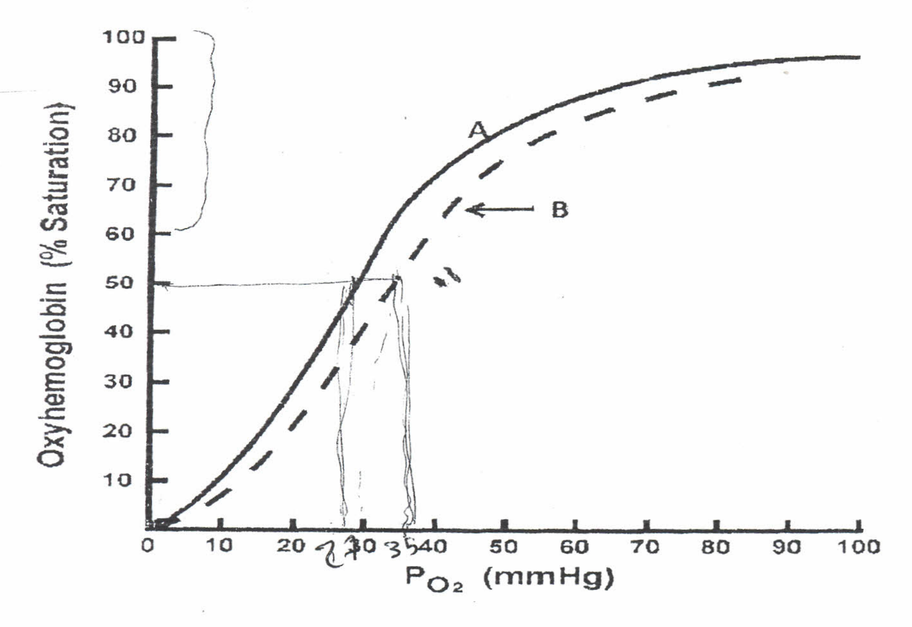
4- What do you expect the blood pH of this patient is? Explain why

5- Does antidiuretic hormone play a role in this situation? Explain your answer

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9- Diagram question: (5marks: each question 1mark)

Study the O_2 dissociation curve below, and then answer the following questions:



Questions:

1- What are the causes of shift of curve A to curve B?

2- How much is P_{50} in curve A and curve B? What does this change mean?

3- Why is the O_2-dissociation curve not linear (S shaped)?

4- What is the significance of the flat portion of the curve?

5- What is the coefficient of O_2 utilization? What does it depend on?

8- Case study: (5marks: each question 1 mark)

A 57-year-old man with long-standing diabetes mellitus and newly diagnosed hypertension presents to his physician for follow-up. The patient has been trying to alter his dietary habits and now exercises more frequently, but the hypertension has persisted. The patient is started on an angiotensin-converting enzyme inhibitor (ACEI) with good results. He is instructed to continue this medication and follow up in several months.

DBP + 1/3 P.P

Questions:

1- What do you expect the measurement of the blood pressure of this patient is? What is meant by mean arterial blood pressure? *more than the 140 before treatment. under treatment below this value* — *average P in arteries during cardiac cycle*

2- Describe the formation of the renin-angiotensin system

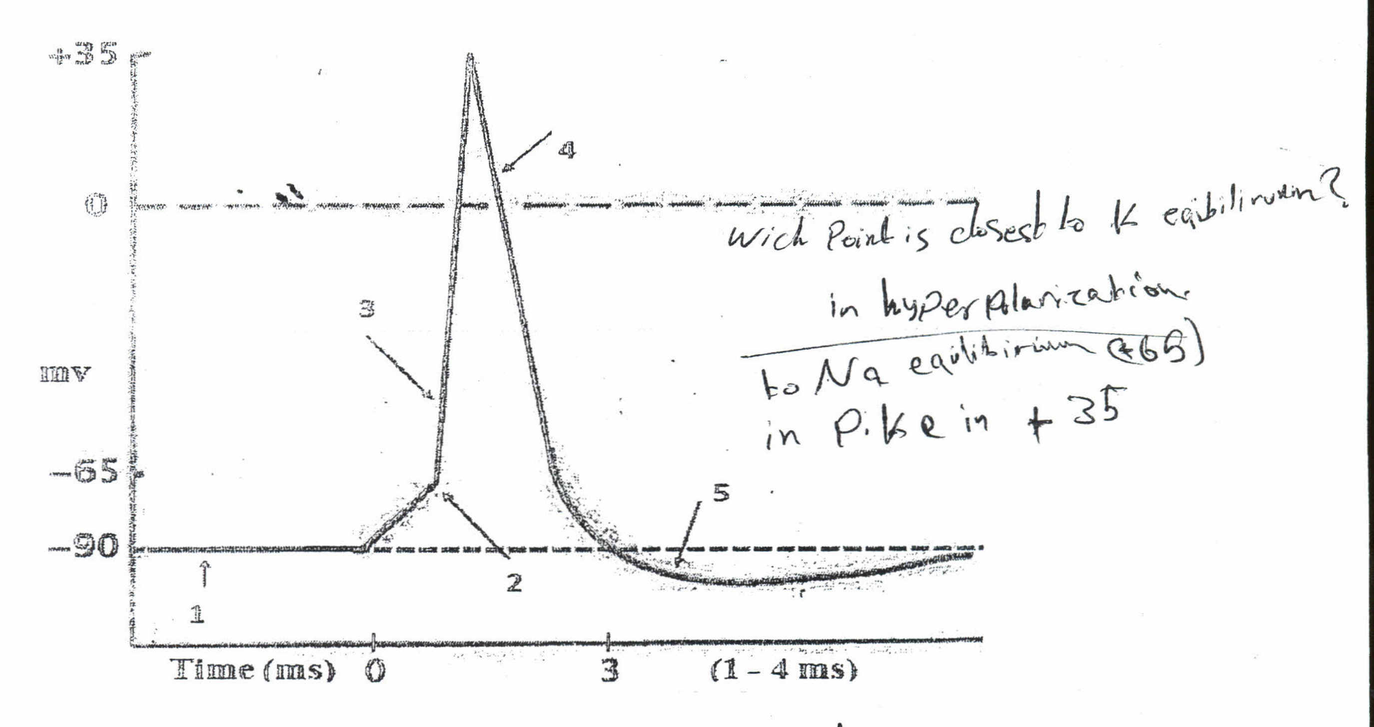
3- What is the action of ACEI? Why it decreases the blood pressure? *inhibit ACE → -- angiotensin II → -- VC & ↓ Na/water reabsorption - b. Volume.*

4- Where is the site of arterial baroreceptors? Mention by which stimulus they are stimulated *arterial blood P and pulse pressure*

5- Explain the effect of elevated blood pressure on the arterial baroreceptors *+++ AbP → a. baroreceptor → +++ CIA → ↓ H.R; --- VMA → VD → ↓ TPR; ↓ CO* — *A F*

9- Diagram question: (5marks: each question 1mark)

Study the curve below, and then answer the following questions:



Questions:

1- What does this curve represent? *AP Nerve Fiber*

2- What does line [1] represent? Mention its cause

3- What does point [2] represent? Mention its cause *Firing level → all Na channel open*

4- What is [3] and [4]? Mention the ionic changes in each one

5- What is [5]? Explain its cause — *slow closure of K*

dep → Na in

rep → inactiv Na & K out

Part II: Case study and Diagram **(Total marks: 10 marks)**

8- Case study: **(5marks: each question 1 mark)**

A 70-year-old man was admitted to the hospital with shortness of breath, severe fatigue and swelling of ankles. His history revealed attacks of angina (myocardial ischemia) and progressive shortness of breath with minimal effort. On examination the main findings were mild cyanosis, increased rate of respiration (20/min), oedema at ankles and over the lower tibias. The chest x-ray showed an enlarged heart and a diffuse density (indicative of fluid in the lungs) at both lung bases. ECG showed left axis deviation. He was diagnosed as heart failure. Treatment included bed rest and administration of digitalis and a diuretic.

Questions:

1- What do you expect the effect of myocardial ischemia on the cardiac output, stroke volume and ejection fraction in this patient?

2- Explain why he was treated with digitalis?

3- Would a Ca^{2+} channel antagonist be helpful in his heart condition? Why?

4- Why he has increased respiratory rate and difficulty in breathing?

5- This patient has oedema of the lower limbs, why?

9- Diagram question: **(5marks: each question 1mark)**

Study the *spirometry* curve below showing different lung volumes and capacities. Answer the following questions:

Volume, L
6
3.0
2.5
1.25
0
1
2
3
4
5
6
7
8

Questions:

1- Define [1] and [2] stating their values

2- What is [4]? Mention its components, its value, what it indicates clinically and 2 lung diseases that decrease it

3- Define [6] and mention its value. What are the diseases which decrease it?

4- Which of the above lung capacities cannot be measured by the spirometry? Mention their representing number on the above curve, their components and values

5- What is [7]? Describe its importance